

CLAIMS

What is claimed is:

- 1 1. A method of producing nitride based heterostructure devices comprising the
2 steps of:
3 providing a substrate; and
4 applying a quaternary layer over the substrate wherein the quaternary layer
5 includes In.
- 1 2. The method of claim 1, wherein the substrate comprises one of the group
2 comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.
- 1 3. The method of claim 1, wherein the quaternary layer further includes Al, Ga
2 and N.
- 1 4. The method of claim 1, further comprising applying a second layer positioned
2 between the substrate and the quaternary layer.
- 1 5. The method of claim 4, wherein the second layer includes GaN.
- 1 6. The method of claim 1, wherein the quaternary layer includes the compound
2 AlInGaN.

- 1 7. The method of claim 6, wherein the quaternary layer includes about a 20% to
2 30% molar fraction of Al.

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- 1 8. The method of claim 7, wherein the quaternary layer further includes about a
2 2% to 5% molar fraction of In.
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1 9. A method of producing nitride based heterostructure devices comprising the
2 steps of:
3 providing a substrate;
4 applying a first layer including GaN over the substrate;
5 applying a ternary layer over the first layer, wherein the ternary layer
6 includes a compound selected from the group comprising AlGa_{1-x}In_xN and InGa_{1-x}Al_xN; and
7 applying a quaternary layer over the ternary layer, wherein the quaternary
8 layer includes AlInGa_{1-x-y}N.

1 10. The method of claim 9, wherein the substrate includes one of the group
2 comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

1 11. The method of claim 9, wherein the quaternary layer includes about a 20% to
2 about 30% molar fraction of Al.

1 12. The method of claim 11, wherein the quaternary layer further includes about a
2 2% to about 5% molar fraction of In.

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1 13. A nitride based heterostructure device comprising:
2 a substrate;
3 a first layer applied over the substrate; and
4 a quaternary layer applied over the first layer wherein the quaternary layer
5 includes In.

1 14. The device of claim 13, wherein the substrate includes one of the group
2 comprising sapphire, SiC, ZnO, a spinel substrate, Si, anodized alumina, and AlN.

1 15. The device of claim 13, wherein the first layer includes GaN.

1 16. The device of claim 13, wherein the quaternary layer includes AlInGaN.

1 17. The device of claim 13, wherein the device is used as one of the group
2 comprising of a field effect transistor, an ultraviolet light emitting diode, a visible
3 light emitting diode, an ultraviolet light photodetector, a visible light
4 photodetector, a dual infrared light emitter and detector, a dual ultraviolet light
5 emitter and detector, a pyroelectric device, a piezoelectric device, a strain sensor,
6 a stress sensor, and a plasma wave electronics device.

1 18. The device of claim 13 further comprising a ternary layer applied between the
2 first layer and the quaternary layer.

1 19. The device of claim 18, wherein the ternary layer includes a compound
2 selected from the group comprising AlGaIn and InGaIn.

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